

Infrasound and the search for MH370

R. Kane, S. Lehman, J. Candy

Lawrence Livermore National Laboratory, Livermore CA

Abstract

The use of non-traditional sensing techniques began a short time following the disappearance of MH370 (3/7/14). These included the CTBTO (Comprehensive Test Ban Treaty Organization) seismic, acoustic, undersea acoustic, and infrasound arrays that monitor and are used to geolocate explosions. Other researchers considered their applicability in the search and determined infrasound and undersea acoustics were possibilities. The infrasound array on Cocos Island was closest to Malaysia and was examined for evidence of an explosion event during the initial search phase [1], when the public was informed that the aircraft may have headed into the Indian Ocean we thought it might be worthwhile to examine the infrasound data from Cocos Island for an aircraft passing by. Infrasound has been shown to include aircraft pressure changes [2] and LLNL S&T researchers examined the Cocos Island data for aircraft signatures. The examination began with the “easy” signal sources; the medium-sized commercial jet aircraft that makes the sometimes daily flight from Christmas Island and passes within 8 km of the array as it lands or takes off. Surprisingly we can’t find these events even when we think we know the times within what is likely minutes! Our poster presentation is intended to create discussion and we present what we have done and what we know, a lack of success doesn’t mean that there cannot yet be an opportunity to learn.

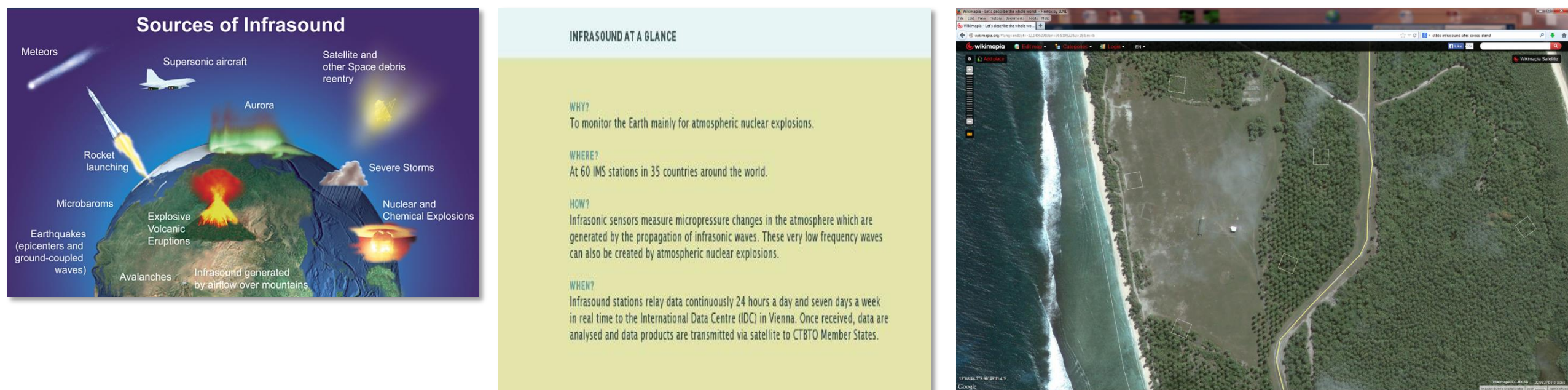
[1]http://www.ctbto.org/fileadmin/user_upload/public_information/2014/IDC_infrasound_MalaysianAirlines_MH370.pdf

[2] **Infrasound Monitoring in the Netherlands**, Láslo Evers, Royal Netherlands Meteorological Institute KNMI, PO Box 201, 3730 AE De Bilt, the Netherlands

Timeline of MH370

Took off from Kuala Lumpur – 3/7, comms and location lost,
Turned, appears to have gone south from analysis of INMARSAT data,
Infrasound searched for crash / explosion noise – not favorable,
Nothing found yet to date, now expanding the search area...

CTBTO Sensors and Infrasound specifically



<http://www.ctbto.org/verification-regime/monitoring-technologies-how-they-work/infrasound-monitoring/>

Infrasound paper reference – Netherlands [2]



Figure 3: The field installation of a microbarometer with a noise reducer attached constructed with soaker hose.

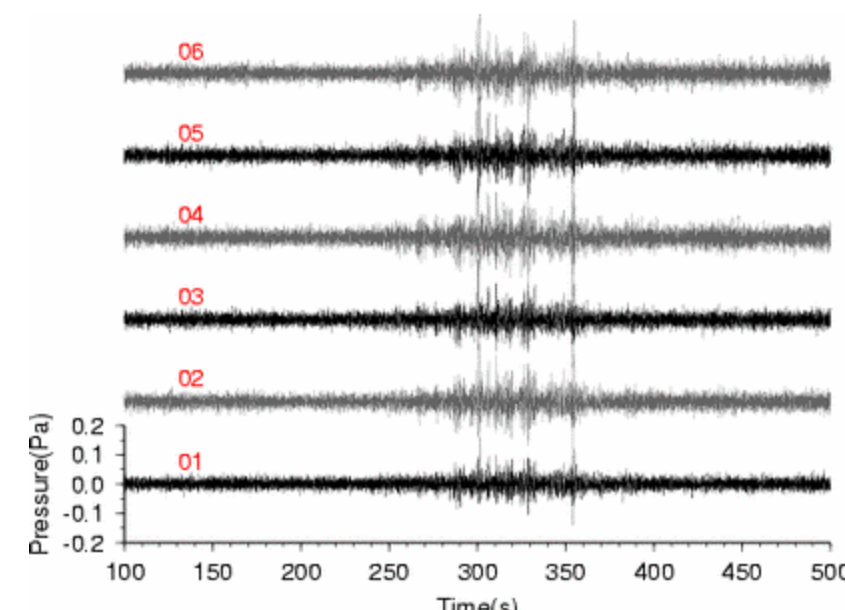


Figure 6: Recordings of DBN. The time axis zero time is 01h12m34.0s GMT on 2003, August 18. The data are band-pass filtered with a second order Butterworth filter with corner frequencies of 0.5 and 19 Hz.

Our Work – an *ad hoc* look

Lunchtime discussions led to conspiratorial speculations

Transition to technical discussions that were plausible in their general physics but provided a better understanding of the

Identification of a possible data source where no mention had been made in the media

Creation of a plan and execution as a short term background effort with the goal of long term observations consistent with that of aircraft passage at a significant distance

Completion as a poster summary and likely an internal report

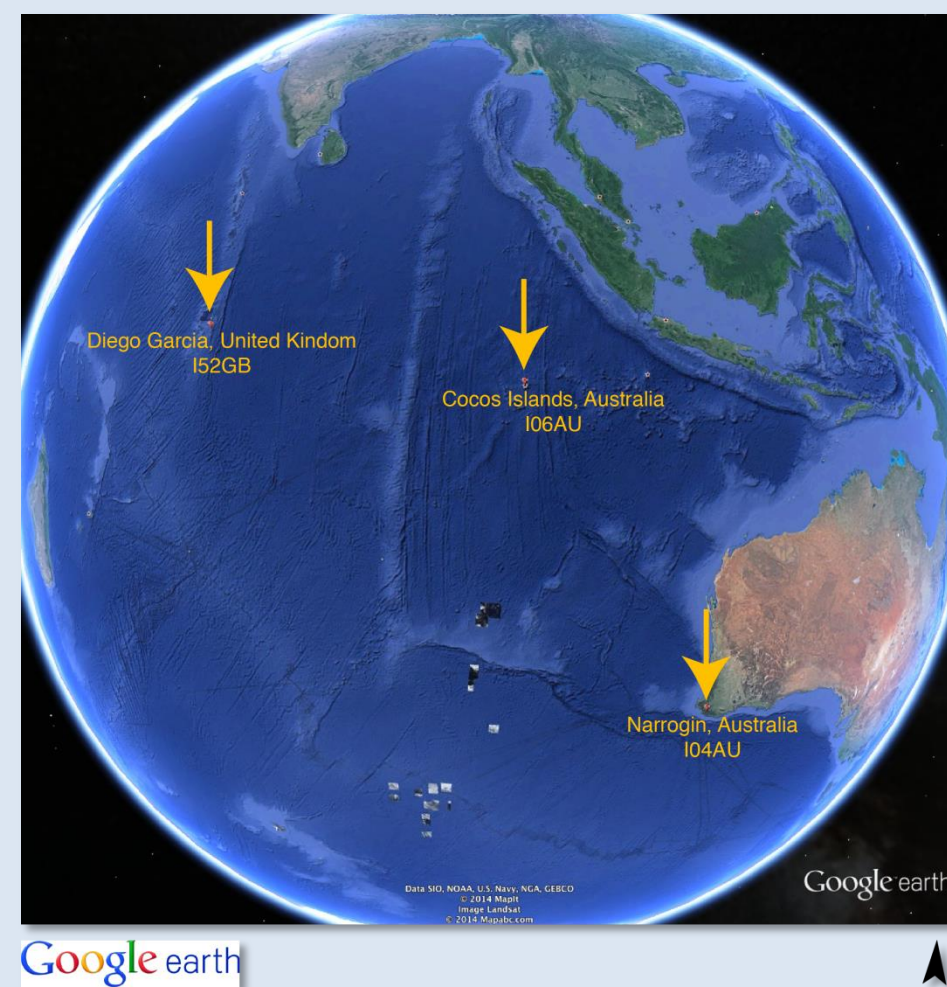
Discussion – what didn’t work?

“Inaudible sound” - < 9 Hz, forested areas preferred to reduce wind noise – this is not what we perceive using our own ears!

The audible noise created by an aircraft is more of what we had anticipated but this was misleading as well as the Netherlands array experience. CTBTO system information indicates a preference for placement of sensors in a forested areas to reduce wind noise and bias the array to be responsive toward measurement of the changes in the microbarometric pressure locally.

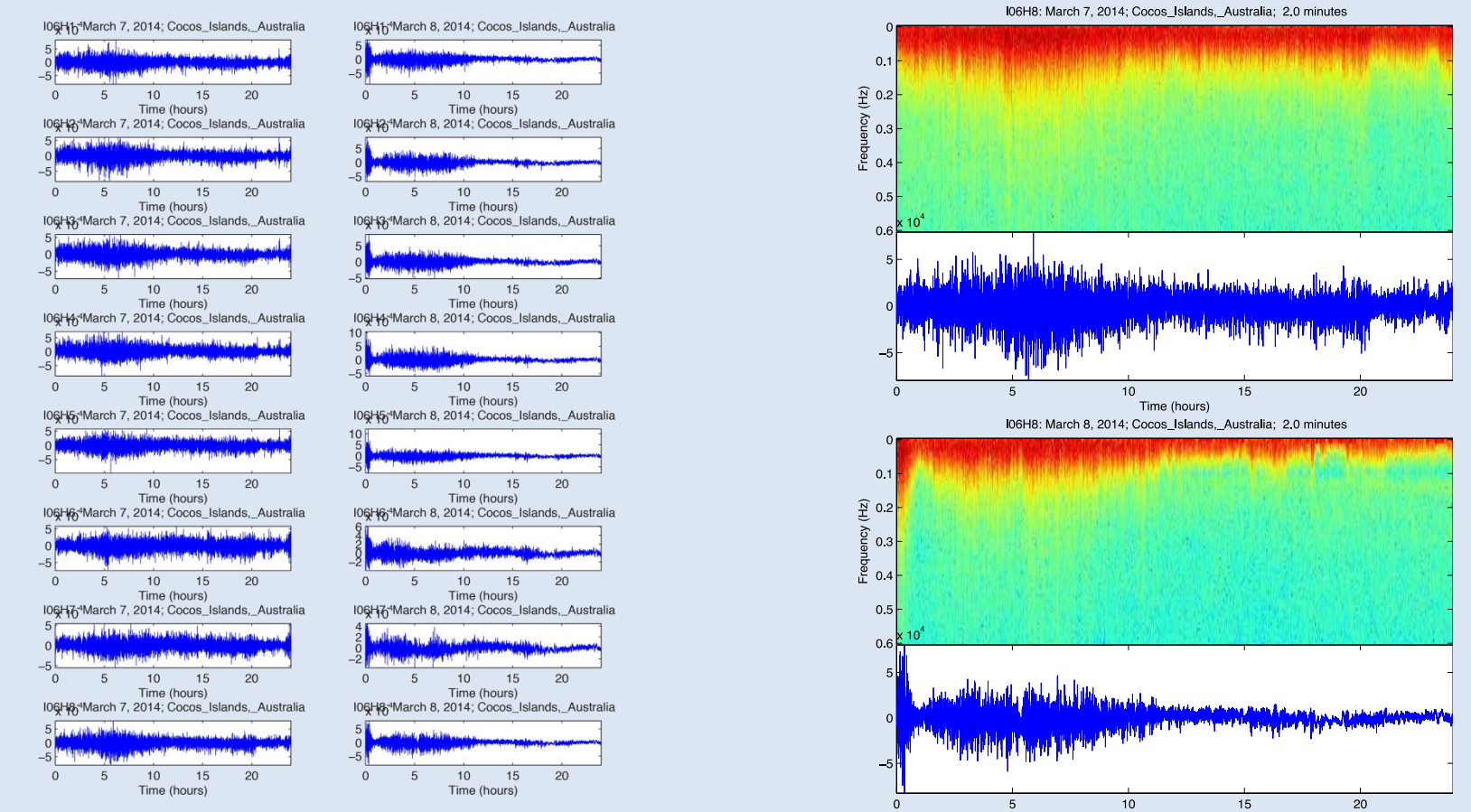
Details

Data from CTBTO

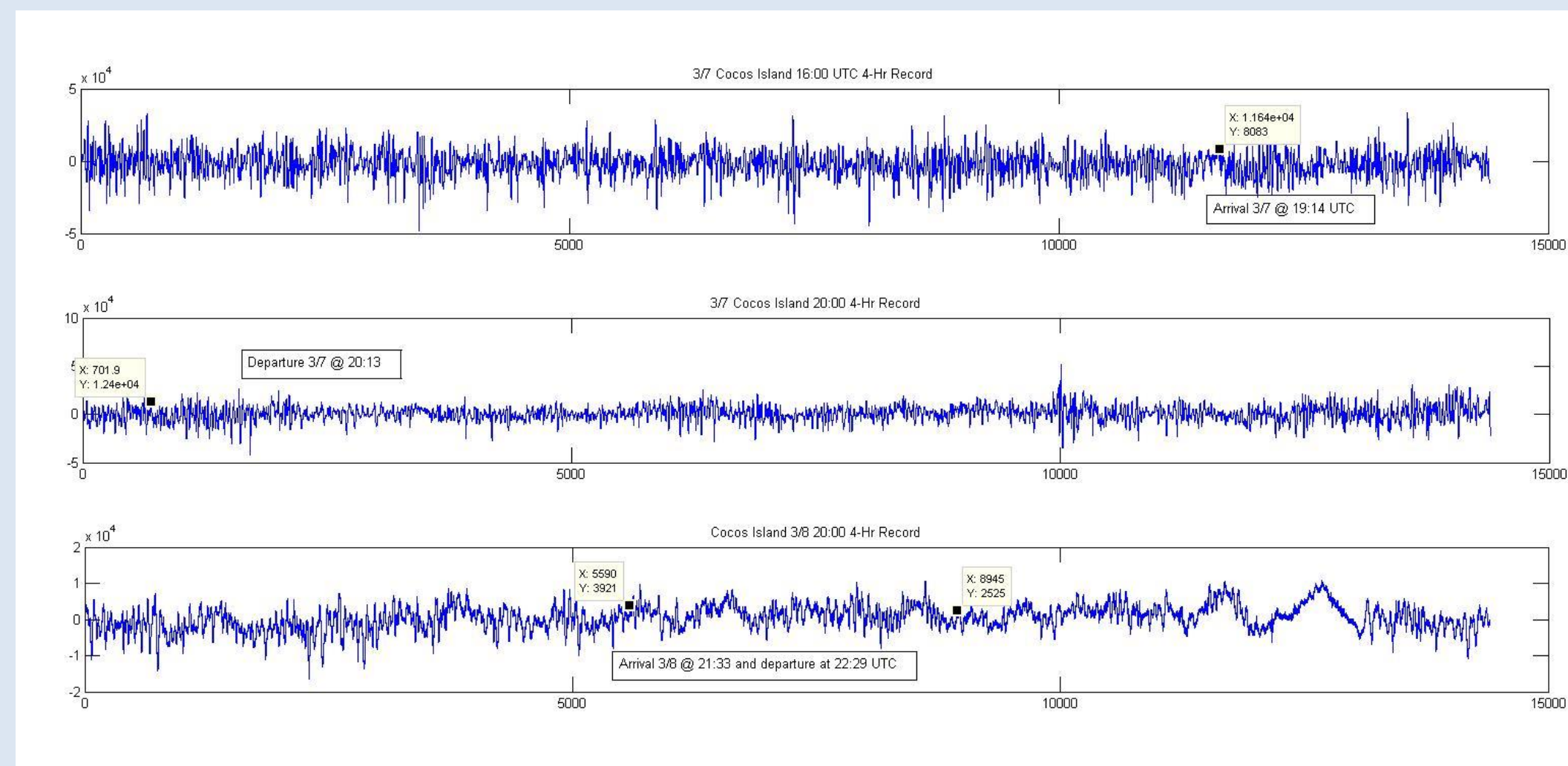


Commercial Flight Information Cocos Island – Christmas Island Infrequent...

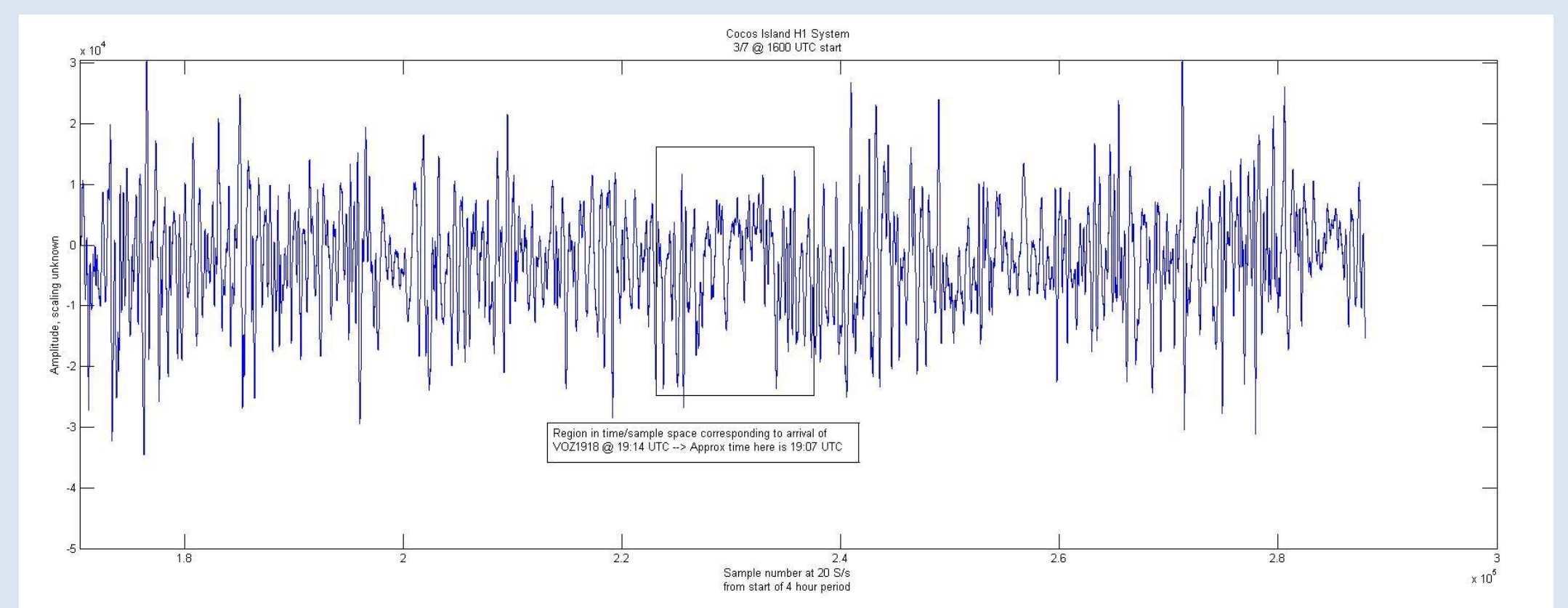
Cocos island time	CCK	UTC+	6:30 hours
Christmas Island	CXT	UTC+	7:00 hours
Flight record archive from www.flightaware.com			
VOZ1918	CXT	CCK	Depart CXT UTC
3/7/2014	12:02	12:44	19:02
3/8/2014	14:10	15:03	21:10
VOZ1917	CCK	CXT	Depart CCK
3/7/2014	13:43	15:37	20:13
3/8/2014	15:59	17:50	22:29
			Arrive CCK UTC
			19:14 UTC
			21:33
			Arrive CXT
			22:37 UTC
			3/9/2014 0:50



Cocos Waveforms – looking for the “obvious”



All data over two days from all 8 sensors in the array



This is the best we have, it’s a small “different” noise-like feature

We don’t see anything to start with in the data with aircraft activity!